

Implementing Cr6⁺ Free Coatings Systems

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Outline

- **Background**
- **Implementation Status**
- **Risk Reduction Approach for Primers**
- **Conclusions and Path Forward**

NAE Position on Cr6+ and Path Forward

- **Cr6+ is used in 10 major metal finishing and corrosion protection processes, with many sub-processes**
 - Cost impact is highest for compliance when removing Cr6+ containing coatings, especially sanding at FRCs
 - Application of most materials can be achieved while complying with regulations
- **Alternatives can be implemented during design and production by OEMs and subcontractors and at Navy and contractor facilities which carry out O, I and D-level maintenance.**
- **Many uses include critical engineering applications including adhesive bonding, wear surfaces and corrosion protection on high-strength steels, and protection of critical structure**
- **Compliance with memo will increase cost of acquisition environmental and corrosion support**
- **Implementation of alternatives is not trivial and requires a risk reduction approach, especially for primers**
- **RDT&E needs to be prioritized and linked to Cr6+ goals**

Implementation Points

- **Design- Implemented at OEMs/Suppliers**
 - New design: finish specifications
 - Easiest to implement, lowest cost, difficult to validate alternatives
- **Production- Implemented at OEM/Suppliers**
 - Engineering Change Proposal (ECP): drawings
 - Medium difficulty to implement, variable cost, validation on fielded assets possible
- **Fielded- Implemented at Gov't and Contractor Facilities**
 - ECP and Local Process Specification modifications; Contract changes; 01-1A-509 and other General Series manual changes
 - Medium difficult to implement for immersion processes, easier for spray and touch up; validation on fielded assets typical

Status of Alternatives at NAVAIR

Alternative Implementation Status					
M&P Area	Sub Area	Location	Process Status	wt vol% of Cr6+ in NAE	%of Cr6+ eliminated
Painting	Support Equipment	Depot and Field	Non-chromate primer in use (MIL-C-53022) for all applications	0	100
	Aircraft and Components	Depot and Field	Non-chromate primer authorized scuff sand and overcoat	TBD	TBD
Bonding		Depot and Field	Alternative not authorized	TBD	0
Sealing		Depot and Field	Chromated and non-chromated sealants in use	TBD	TBD
Aluminum Pretreatment	Avionics/Electrical	Depot and Field	Alternative not authorized	TBD	TBD
	Components/Structure	Cherry Point-Aircraft re-paint (spray)	Authorized for use under chromated primer (TCP). Demonstration and validation underway assessing TCP with leading NC primer on aircraft	TBD	100
		North Island- Aircraft re-paint (spray)		TBD	0
		Jacksonville- Aircraft re-paint (spray)		TBD	0
		Cherry Point- Component Immersion tanks		TBD	0
		North Island- Component Immersion tanks		TBD	0
		Jacksonville- Component Immersion tanks		TBD	0
		Field		TBD	0
Aluminum Anodizing	Sealing Type II & III	Cherry Point	Authorization of alternative (TCP) pending authorization letter. Jacksonville planning to implement TCP as soon as authorization is completed.	TBD	0
		North Island		TBD	0
		Jacksonville		TBD	0
	Sealing Type IC	Cherry Point	Authorization of alternative (TCP) pending results of fatigue testing.	TBD	0
		North Island		TBD	0
		Jacksonville		TBD	0
	Sealing Type IIB	Cherry Point	Type IIB not authorized currently. Dem/val underway to produce data for potential authorization as Type IC alternate. Being considered by Jacksonville as part of single tank Type II, IIB and III anodize system. Authorization of alternative (TCP) pending results of fatigue testing.	TBD	0
		North Island		TBD	0
		Jacksonville		TBD	0

Status of Alternatives at NAVAIR

Alternative Implementation Status					
M&P Area	Sub Area	Location	Process Status	wt vol% of Cr6+ in NAE	%of Cr6+ eliminated
Sacrificial Coatings	Cadmium Post Treatment	Cherry Point	Authorization of alternatives pending review of available data	TBD	0
		North Island		TBD	0
		Jacksonville		TBD	0
	IVD Aluminum Conversion	Cherry Point	Authorization of alternative (TCP) pending results of field testing.	TBD	0
		North Island		TBD	0
		Jacksonville		TBD	0
	Zn-Ni Post Treatment	Cherry Point	Authorization of alternatives pending review of available data	TBD	0
		Jacksonville		TBD	0
Magnesium Conversion Coating		Cherry Point	Authorization pending for alternative use in component recoating and touch up (Alodine 5700 and TCP)	TBD	TBD
		Jacksonville	Authorization pending for alternative use in component recoating and touch up (Alodine 5700 and TCP)	TBD	0
		Field	Authorization pending for alternative use in component coating touch up (Alodine 5700 and TCP)	TBD	TBD
Hard Chrome Plating		Cherry Point	HVOF coatings authorized; limited to low stress/spalling risk applications	TBD	TBD
		North Island		TBD	TBD
		Jacksonville		TBD	TBD
Titanium Conversion Coating		Depot and Field	Authorization of alternatives pending review of available data	TBD	TBD
Phosphating	Steel, "rinse"	North Island	Mn-phosphate process with chromate rinse. New alternative being assessed (ChromiPhos).	TBD	0
		Cherry Point	Zn-phosphatate process with chromate rinse. New alternative being assessed (ChromiPhos).	TBD	0

Implementation Progress

- **Use of Chromates in Inorganic Coatings and Processes**
 - Alternatives authorized for
 - Hard Chrome Plating
 - Conversion coating under chromated primer
 - Conversion coating on Alumiplate under chromated primer
 - Alternatives pending authorization
 - Sealing of Type IC, IIB, II and III anodize using chromated primer or unprimed
 - Conversion coating magnesium and titanium
 - Alternatives being assessed in demonstration and validation projects
 - Post treatment of IVD aluminum with chromated primer
 - Post treatment of ZnNi with chromated primer
 - Rinsing/sealing of phosphate coatings with various primers and topcoats

Implementation Progress

- **Use of Chromates in Organic Coatings and Processes**
 - Alternatives authorized for
 - Priming of support equipment (MIL-DTL-53022)
 - Sealing- various specifications
 - Priming aircraft/components in overcoat applications
 - Alternatives pending authorization
 - N/A
 - Alternatives being assessed in demonstration and validation projects
 - Primer “direct to metal/conversion coating” in coating systems with chromated or non-chromated conversion coatings
 - Galvanic primers in total NC systems
 - Alternatives requiring additional research and development
 - Adhesive bond primers
 - Combination of NC primers with other NC finishing options in most applications

Primer Risk Assessment

- **Application Axis vs. Platform/Basing Axis**
- **Application Axis – Low-High Risk**
 - 1 (L) – Composite/Fiberglass Surfaces
 - 2 (L) – Non-critical Metallic Surfaces – External Fuel Tanks, etc.
 - 3 (M) – Airframe Tie-Coat Applications
 - 3A – OML / 3B – IML – Topcoat, or inspectable areas only
 - 4 (M-H) – Airframe Direct-to-Metal Applications
 - 4A – OML / 4B – IML
 - 5 (H) – Interior/Faying Surface/HS Components.

Primer Risk Assessment

- **Platform Axis**

- 1 (L) – Trainer Aircraft – T-45, T-34, etc.
- 2 (M) – Land based Aircraft – KC-135, C-40, etc.
- 3 (M-H) – Special Land – P-8, H-53, etc.
- 4 (H) – Ship-based Aircraft – E-2, H-60, etc.
- 5 (H) – Ship-based Aircraft – *Specialty Coatings
 - F/A-18, EA-18G, F-35, etc.

Status of Primer Assessments

- **Primer options:**

- MIL-PRF-85582:
 - **EW DY048A (PPG)**- Good beach testing results (8 yrs); NI implemented in E2/C2 component paint shop in ~2006.
 - **44-GN-098 (Deft)**- baseline primer for F-35
- MIL-PRF-23377:
 - **16708TEP (Hentzen)**- Extensive coupon testing underway
 - **02-GN-084 (Deft)**-
 - North Island plans to transition E2/C2 component work in 2009/10
 - T-45: implement at NAS Kingsville and Meridian via contract change (contract maintenance)
 - Mg-rich Primer (Akzo)- ESTCP dem/val; validation of latest products underway

- **Field Testing Status:**

- FRC SW (North Island)
 - Four E-2 production aircraft: carrier deployed
 - 02-GN-084- first painted in April 2009. 2nd planned for fall 2009.
 - Using standard (Type I) hexavalent chromium pretreatment (spray applied); Type II pretreatments possible pending results of initial demos
- FRC SE (JAX)
 - Limited P-3 demo, several primers (wheel)
- Pax- lab and beachfront assessments of total NC systems on plain panels and galvanic assemblies
- RQ-8B/Firescout- full NC coating system demo on LRIP aircraft- Type II conversion/084 primer- 2010

E-2 in Paint Hanger at North Island



Field Test Example

- E-2 rotodome at North Island, 4/09



-Low risk application
on high-risk platform

Field Test Example

- **RQ-8B Firescout**



-Medium-high risk
application on high-
risk platform

- Full NC coating
system on tailcone,
direct to metal

Conclusions & Path Forward

- **Alternatives available for most applications- authorization and transition underway in many areas- most rely on use of chromated primer**
- **Implementation of qualified NC primers on low risk applications/aircraft underway**
- **Field testing of qualified NC primers/coating systems on higher risk applications and aircraft will continue**
- **An Engineering Circular will be completed which documents NAVAIR Materials Engineering Division policy for NC Coating Systems and contain information on:**
 - State-of-the-art products & processes
 - Transition drivers
 - Testing requirements
 - Demonstration and validation requirements
 - Transition approach
 - Risk analysis
 - Implementation recommendations